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### (54) BIOPSY FORCEPS FOR OBTAINING TISSUE SPECIMEN AND OPTIONAL FOR COAGULATION

BIOPSIEZANGE ZUM NEHMEN VON GEWEBEPROBEN UND EVENTUELLE ZUM KOAGULIEREN

FORCEPS BIOPSIQUE POUR LE PRELEVEMENT DE TISSUS ET POUR LA COAGULATION LE  
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DescriptionField of the Invention

[0001] Biopsy forceps, especially for endoscopic procedures, which enable tissue samples to be cut and retrieved, and which can coagulate the incision if necessary, while still at the situs of the excision.

Background of the Invention

[0002] Biopsy forceps, especially those which are intended for endoscopic use, provide a pair of mutually articulated jaws that can be opened at a situs where tissue is to be excised, and closed to cut and contain the specimen so it can be removed and examined. This is a routine procedure which rarely involves a complication. The wound is small and routinely heals.

[0003] However, the location of the situs is always concealed from the surgeon, who must rely on telescopic or video means to observe the procedure, and occasionally a cut will be made through a vessel. In that event coagulation is necessary. In the prior art the forceps must be removed, and then coagulating means must be passed to the bleeding situs. The blood at the situs obscures the wound from being seen by any optical or video observation means. Locating the wound to be coagulated is both difficult and time-consuming, all to the disadvantage of the patient.

[0004] GB-A-2128881 discloses a rigid biopsy forceps having a distal mount and jaws with coagulating capabilities whereby an inner insulated control rod connects the jaws to a proximal electrical connector.

[0005] DE-A-3707820 discloses a flexible biopsy forceps having jaws with HF-cutting capabilities.

[0006] It is an object of this invention to enable the surgeon not only to excise the specimen, but also, if the cutting results in excessive bleeding, then without removing the forceps, to coagulate the wound. As a consequence, the coagulation occurs precisely where it is needed, and without delay to remove the forceps and to find and to place coagulating means where it is needed.

[0007] The problems of holding a specimen while it is being cut loose are well-known. When the forceps jaws are closed, the sample tends to slip before it is completely trapped. Then the desired tissue may not be caught. This problem, has been addressed and solved in Bales patent No. 5,133,727, in which a pair of articulated jaws enclose a spear between them which impales the tissue and holds it in place while the jaws are closed to cut the specimen free.

[0008] It is an object of this invention to provide the stabilizing means shown in the Bales patent, and also to provide coagulating means to coagulate the wound while the forceps is still in place, if necessary. While this procedure sacrifices the specimen, it does attend to the wound, and leaves a clean field for a repeat effort to obtain a specimen.

Brief Description of the Invention

[0009] A forceps according to this invention includes a flexible support cable having a proximal and a distal end. The cable is flexible and tubular. It has an outer wall and an inner wall that forms a central passage.

[0010] A jaw mount is fastened to the support cable at its distal end. Two jaws are pivotally mounted to the jaw mount so as to open and close. They are provided with sharp cutting edges to form an enclosure which when the jaws are closed will retain a tissue specimen that the jaws cut loose when they were closed.

[0011] A control wire passes through the passage in the control cable, and is connected to the jaws so that reciprocating the control wire relative to the support cable will open and close the jaws.

[0012] A stabilizing spear is mounted to the mount. It extends into the enclosure. Its sharp point is directed between the jaws when they are open to spear a specimen to be excised.

[0013] According to this invention, the external wall of the support cable bears a layer of insulation to insulate it from the patient's body. The external wall of that portion of the control wire which is inside the support cable also bears a layer of insulation, thereby insulating the control wire from the support cable along that part of its length.

[0014] The control wire is electrically conductive, and is conductively connected to the jaws and because the jaws and the spear are metal and connected to one another, also to the spear.

[0015] Should coagulation be required, a high frequency burst of electrical energy is applied to the control wire and thus to the jaws. The patient himself is connected into the circuit, usually through a metal plate pressed against him. The resulting heat will coagulate the tissue which is in contact with the jaws and the spear.

[0016] The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawing, in which:

Brief Description of the Drawings

[0017]

45 Fig. 1 is a side view, partly in axial cross-section, showing the preferred embodiment of the invention; Fig. 2 is a back view of Fig. 1 also in partly an axial cross section;

50 Fig. 3 is a right hand side view taken in Fig. 2, also partly in axial cross-section; and Fig. 4 is a cross section taken at line 4-4 in Fig. 1.

Detailed Description of the Invention

55 [0018] A forceps 10 according to this invention includes a flexible support cable 11. This cable is hollow. It conveniently is formed as a closely wound metal

spring with convolutions 12 forcing a central passage 13. A control wire 14 is slidingly fitted in passage 13.

[0019] The support cable has a proximal end 15 adapted to be attached to control means (not shown), such as a scissors type handle. The cable and the wire are attached to separate parts of the control means so the wire can be shifted axially in the passage.

[0020] A jaw mount 20 is attached to the distal end 23 of the cable. It supports electrically conductive jaws 24, 25, which are pivotally mounted to one another. There are various types of pivotal support for the jaws, of which this is merely one example. The important feature is that the jaws will be opened and closed relative to one another when the control wire is moved one way or the other.

[0021] Jaws 24, 25 have respective curved walls 26, 27 that have sharp edges 28, 29. When brought against or past one another they both cut and trap a tissue specimen in the enclosure 30 formed by them.

[0022] A metal stabilizing spear 35 is also mounted to the jaw mount. It has a shaft 36 with a pointed end 37 directed into the enclosure. When the forceps, with the jaws open, is pressed against the tissue to be excised, it stabs and stabilizes the tissue against lateral movement while the jaws make the cut.

[0023] As discussed this far, the arrangement is conventional. If the cut does not cause excessive bleeding such as by cutting a vein, nothing more is required. However, if such a cut is made, then without more the forceps must be removed, and a coagulator inserted. Then the search begins for the wound. It is a time consuming and potentially difficult task.

[0024] According to this invention, a layer 40 of insulating materials such as Teflon covers the outer wall of the support cable. It is conveniently applied as a tube and shrunk onto the support cable. It insulates the patient from the cable itself.

[0025] Further, a layer 41 of insulating material such as Teflon covers the outer wall of that part of the control wire which is in the passage. Again it can conveniently be applied as a tube and shrunk onto the control wire. This serves to insulate the length of the control wire from the support cable. As will be noted, the conductive mount and the control cable are in contact. However, the proximal end of the cable is not connected into the circuitry. The patient is insulated from the support cable.

[0026] A power supply 42 of conventional design, and a control switch 43 are connected to the control wire. A metal plate 44 against the patient 45 is connected to the power supply, thereby completing a path for the current whose effect is to coagulate tissue that is in contact with the jaws and the spear. After the coagulation is completed, the forceps will be withdrawn.

[0027] The tissue sample will have been sacrificed. However, the wound will have been coagulated, and a clean field remains for the next cut after the sample is removed and the forceps is again inserted.

[0028] Accordingly a forceps is provided which in ad-

dition to its cutting and stabilizing features is provided with coagulating means available for use immediately at the cutting situs should it be needed.

[0029] This invention is not to be limited by the embodiment shown in the drawings and described in the description, which is given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

## 10 Claims

### 1. A biopsy forceps apparatus (10) comprising:

15 a flexible hollow support cable (11) with a proximal end, a distal end and a central passage (13) from end to end, said support cable having an insulating layer (40) surrounding an outer surface of the support cable (11) from end to end; a single, electrically conductive control wire (14) slidably fitted in and extending through said central passage, said electrically conductive control wire (14) having an insulating layer (41), surrounding that portion of the control wire which is inside said support cable (11); an electrically conductive mount (20) connected to said support cable and said control wire at a distal end thereof, and comprising means for pivotally supporting a pair of electrically conductive metal jaws (24, 25) at the distal end of said support cable, said jaws having curved walls (26, 27) with sharp cutting edges which together form an enclosure when closed to trap an excised tissue specimen; an electrically conductive spear means (35) for stabilizing and holding tissue to be excised by said jaws, said spear means connected to said mount (20) at the distal end of said support cable, and having a shaft (36) with a pointed end (37) extending into the enclosure formed by said jaws (24, 25) as they are closed to excise tissue; and means (42, 43) for connection of said electrically conductive control wire to a source of electrical current so as to permit selective energizing of said control wire (14) or mechanical closing of said jaws (24, 25) to excise tissue, and thereby simultaneous energizing of the mount, jaws and spear means;

whereby tissue can be either excised or cauterized by said apparatus, as selected by a user.

55 2. A biopsy forceps according to claim 1 in which said cable (11) is a flexible tightly wound helical spring.

3. A biopsy forceps according to claim 1 in which said

insulating layers (40, 41) are tubes of insulative material shrunk onto the support cable and onto the control wire.

4. In combination:

a biopsy forceps (10) according to claim 1, a power supply (42) for electrical current, switch means (43) interconnecting said control wire at its proximal end to said supply, and a conductive plate (44) connected to said power supply (42) for attachment to a patient in whom a biopsy is to be performed.

**Patentansprüche**

1. Biopsiezangenvorrichtung (10) umfassend:

ein flexibles, hohles Haltekabel (11) mit einem proximalen Ende, einem distalen Ende und einem zentralen Durchgang (13) von Ende zu Ende, wobei das Haltekabel eine isolierende Schicht (40) aufweist, welche eine äußere Fläche des Haltekabels (11) von Ende zu Ende umgibt;

einen einzelnen, elektrisch leitfähigen Steuerdraht (14) welcher gleitbar in den zentralen Durchgang eingepaßt ist und sich durch diesen erstreckt, wobei der elektrisch leitfähige Steuerdraht (14) eine isolierende Schicht (41) aufweist, welche denjenigen Abschnitt des Steuerdrahtes umgibt, welcher sich innerhalb des Haltekabels (11) befindet;

eine elektrisch leitfähige Halterung (20), welche mit dem Haltekabel und dem Steuerdraht an einem distalen Ende davon verbunden ist und welche Mittel zur schwenkbaren Halterung eines Paars elektrisch leitfähiger Metallklauen (24, 25) am distalen Ende des Haltekabels aufweist, wobei die Klauen gebogene Wände (26, 27) mit scharfen Schneidkanten aufweisen, welche zusammen eine Einfassung bilden, wenn sie geschlossen sind, um eine exzidierte Gewebeprobe zu umfassen;

ein elektrisch leitfähiges Speermittel (35) zum Stabilisieren und Halten von von den Klauen zu exzidierendem Gewebe, wobei das Speermittel mit der Halterung (20) am distalen Ende des Haltekabels verbunden ist und einen Schaft (36) mit einem spitzen Ende (37) aufweist, welcher sich in die Einfassung, die von den Klauen (24, 25) gebildet ist, erstreckt, wenn diese geschlossen sind, um Gewebe zu exzidieren; und Mittel (42, 43) zum Verbinden des elektrisch

leitfähigen Steuerdrahtes mit einer Quelle elektrischen Stromes, um selektives Erregen des Steuerdrahtes (14) oder mechanisches Schließen der Klauen (24, 25) zu erlauben, um Gewebe zu exzidieren, und dabei die Halterung, die Klauen und das Speermittel gleichzeitig zu erregen;

wobei Gewebe von der Vorrichtung je nach Wahl eines Benutzers entweder exzidiert oder kauterisiert werden kann.

2. Biopsiezange gemäß Anspruch 1, in welcher das Kabel (11) eine flexible, straff gewundene Schraubenfeder ist.

3. Biopsiezange gemäß Anspruch 1, in welcher die isolierenden Schichten (40, 41) Röhren aus einem isolierenden Material sind, welches auf das Haltekabel und auf den Steuerdraht geschrumpft sind.

4. In Kombination:

eine Biopsiezange (10) gemäß Anspruch 1, eine Energieversorgung (42) für elektrischen Strom, Schaltermittel (43) welche den Steuerdraht an seinem proximalen Ende mit der Versorgung verbinden, und eine leitfähige Platte (44), welche an die Energieversorgung (42) angeschlossen ist, zum Anbringen an einem Patienten, in welchem eine Biopsie durchgeführt werden soll.

**35 Revendications**

1. Appareil formant forceps pour biopsie (10) comprenant :

un câble support creux flexible (11) ayant une extrémité proximale, une extrémité distale et un passage central (13) d'une extrémité à l'autre, ledit câble support ayant une couche isolante (40) entourant une surface extérieure du câble support (11), d'une extrémité à l'autre ;  
un unique fil de commande (14), conducteur de l'électricité, adapté coulissant dans ledit passage central et s'étendant au travers de celui-ci, ledit fil de commande (14), conducteur de l'électricité, ayant une couche isolante (41) entourant la portion du fil de commande qui est à l'intérieur dudit câble support (11) ;  
un support conducteur de l'électricité (20) connecté audit câble support et audit fil de commande au niveau d'une extrémité distale de ceux-ci, et comprenant des moyens pour supporter, de manière pivotante, une paire de mâchoires métalliques conductrices de l'électricité

(24,25) au niveau d'une extrémité distale dudit câble support, lesdites mâchoires ayant des parois courbes (26,27) offrant des arêtes tranchantes et formant entre elles une enceinte lorsqu'elles sont fermées pour piéger un échantillon de tissu à exciser ;  
un moyen formant lancette conductrice de l'électricité (35) pour stabiliser et tenir le tissu à exciser par le biais desdites mâchoires, ledit moyen formant lancette étant connecté audit support (20) au niveau de l'extrémité distale du dit câble support, et ayant un axe (36) présentant une extrémité pointue (37) se projetant dans l'enceinte formée par lesdites mâchoires (24,25) lorsqu'elles se ferment pour exciser le tissu ; et  
des moyens (42,43) pour connecter ledit fil de commande conducteur de l'électricité à une source de courant électrique de manière à permettre l'excitation sélective dudit fil de commande (14) ou la fermeture mécanique des mâchoires (24,25) pour exciser le tissu, et excitant ainsi simultanément le support, les mâchoires et le moyen formant lancette,

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grâce à quoi le tissu peut être soit excisé soit cautérisé par ledit appareil, selon la sélection de l'utilisateur.

2. Forceps pour biopsie selon la revendication 1, dans lequel ledit câble (11) est un ressort hélicoïdal flexible à spires serrées.
3. Forceps pour biopsie selon la revendication 1, dans lequel lesdites couches isolantes (40,41) sont des tubes de matériau isolant rétrécis sur le câble support et sur le fil de commande.

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4. En combinaison :

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un forceps pour biopsie (10) selon la revendication 1, une alimentation (42) en courant électrique, des moyens commutateurs (43) interconnectant ledit fil de commande au niveau de son extrémité proximale à ladite alimentation, et une plaque conductrice (44) connectée à ladite alimentation (42) pour la fixation au patient sur lequel une biopsie doit être mise en oeuvre.

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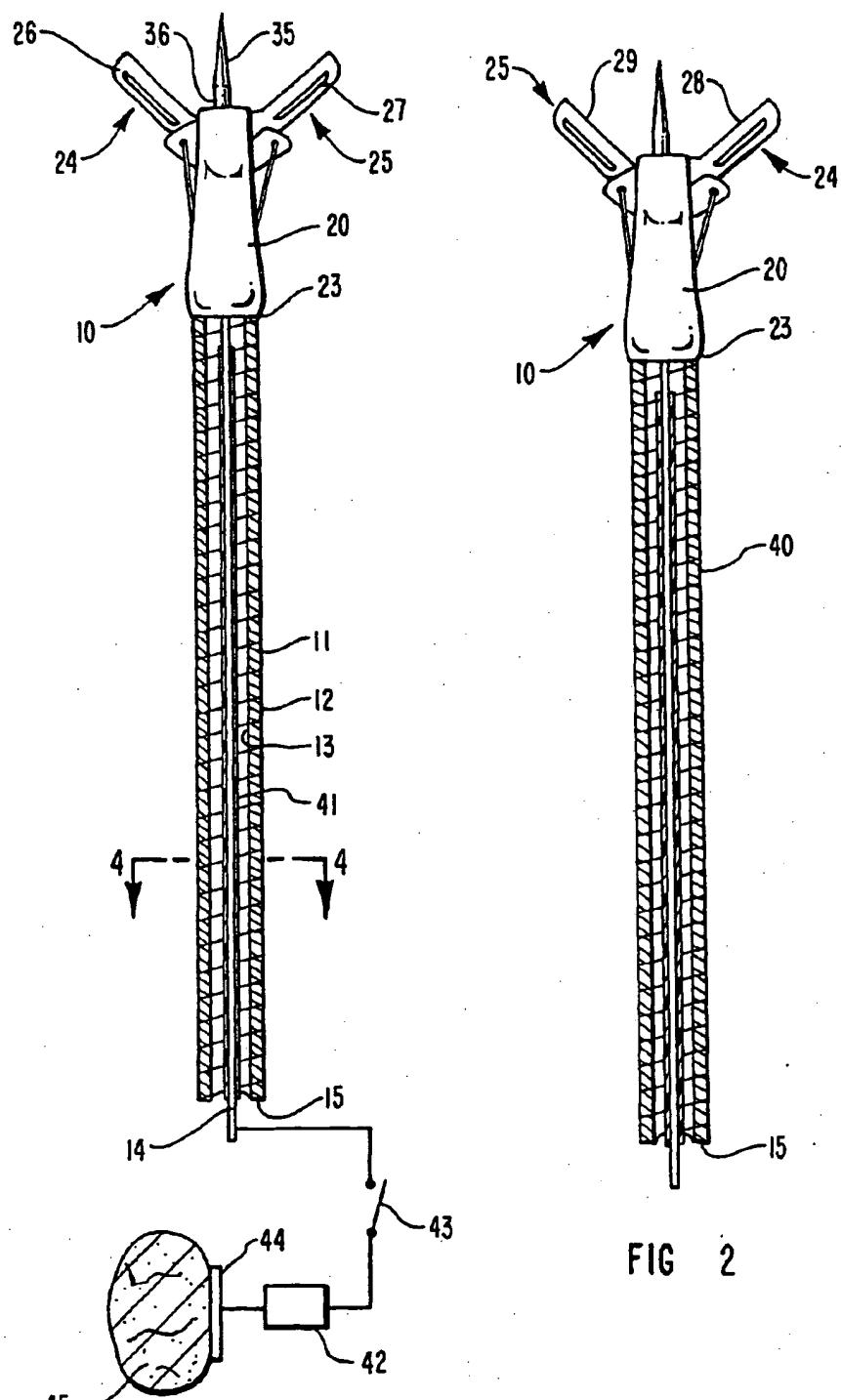
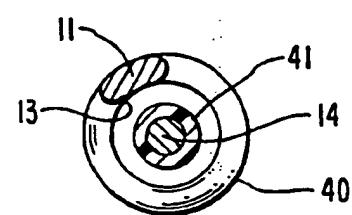
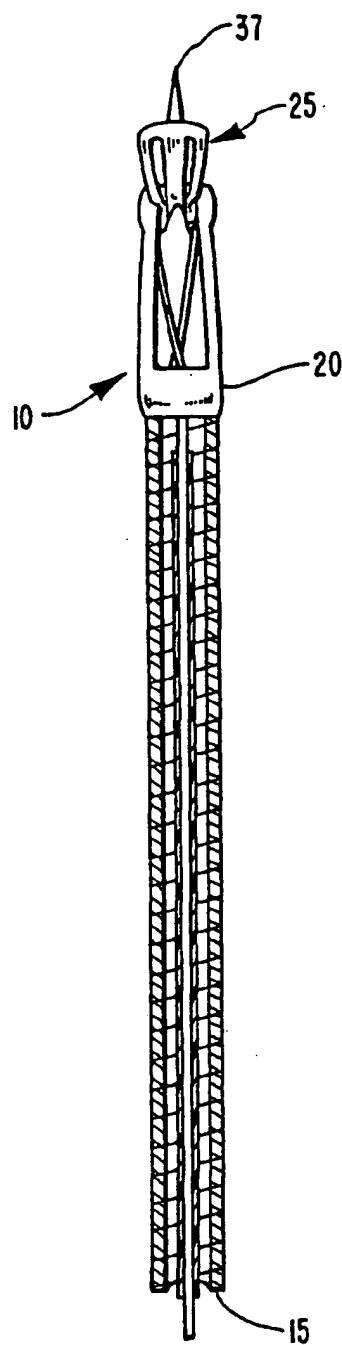


FIG. 1

FIG. 2



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